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PROFESSOR J. C. ADAMS, F.R.S., President, in the Chair.

Professor Cleveland Abbe, U.S. Meteorological Office, Washington;

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Harris Charles Lindon Saunders, Esq., Leacroft House, Staines; and

Major W. H. Wardell, R.A., 3 Alexandra Terrace, Sheerness;

were balloted for and duly elected Fellows of the Society.

Observations of the Solar Eclipse. 1875. September 29, made at the University Observatory, Strasburg.

(Communicated by Professor Winnecke.)

This Eclipse was observed by Dr. Schur with the Heliometer which was used by him during the observations of *Venus*, December 9, 1874, in Auckland Island, and by Herr Hartwig with the Heliometer of the German Expedition to the Mauritius. Both Heliometers were again erected at Strasburg for a redetermination of their different constants, after their return from the expeditions. They have an aperture of $0^m.076$, and their local distance is $1^m.15$. The atmospheric conditions were by no means favourable during the Eclipse; clouds were frequently passing

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and troubled the observations, so that the first two measures of Dr. Schur and one of Herr Hartwig had to be rejected.

Dr. Schur measured, with power 47, the following chords:—

Mean Time Strasburg.			Distance of Cusps.	Errors.
h	m	s	"	"
0	33	44.0	471.22 +i	− 0.55
	36	56.0	525.63 −i	− 0.62
	38	43.0	546.54 −i	− 1.55
	40	56.0	557.00 +i	+ 1.41
	42	33.5	572.41 +i	− 1.64
	45	2.0	588.97 −i	+ 3.96
	46	46.5	603.93 −i	− 3.71
	49	3.5	595.06 +i	+ 3.39
	54	1.5	597.23 +i	+ 0.40
0	56	17.0	598.13 −i	+ 0.65
1	5	11.0	529.21 −i	+ 1.83
	7	15.5	498.24 +i	− 1.89
	9	47.5	455.62 +i	− 0.65
	14	51.5	343.36 −i	− 0.16

The error in the adopted point of coincidence of the images formed by the two halves of the object-glass is put = *i*.

Diminishing the *Nautical Almanac* R.A. of the Moon by 10".5, according to the observations by Herr Hartwig, with the Transit,* and correcting by −1".90 the *N.A.* semidiameter of the Sun, according to Schlüter's measures with the Königsberg Heliumeter,† and by −2".30, the *N.A.* semidiameter of the Moon, on the authority of Oudemans,‡ Dr. Schur got, by taking :

- dr* = Correction to the adopted semidiameter of the Sun,
- dR* = " " " " " " Moon,
- dx* = " " " " excess of Moon's R.A. over Sun's R.A,
- dy* = " to excess of Moon's Decl. over Sun's Decl.

the following equation of conditions:—

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$$\begin{aligned} 0 &= -16.68 + 4.127 dr + 4.138 dR + 3.197 dx + 2.420 dy - i \\ 0 &= -22.91 + 3.731 + 3.742 + 2.787 + 2.278 + i \\ 0 &= -23.44 + 3.584 + 3.597 + 2.623 + 2.238 + i \\ 0 &= -12.64 + 3.444 + 3.457 + 2.455 + 2.209 - i \end{aligned}$$

* *Astron. Nachrichten*, vol. lxxxvi. p. 154.
† *Monthly Notices*, vol. xxi. p. 180.
‡ *Astron. Nachrichten*, vol. lii. p. 28.

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1876MNRAS...35...85W

o =	-15.56	+ 3.367 <i>dr</i>	+ 3.379 <i>dR</i>	+ 2.352 <i>dx</i>	+ 2.201 <i>dy</i>	- <i>i</i>
o =	-17.39	+ 3.279	+ 3.293	+ 2.221	+ 2.205	+ <i>i</i>
o =	-25.10	+ 3.238	+ 3.252	+ 2.144	+ 2.220	+ <i>i</i>
o =	-10.70	+ 3.207	+ 3.221	+ 2.060	+ 2.255	- <i>i</i>
o =	-14.49	+ 3.216	+ 3.230	+ 1.927	+ 2.382	- <i>i</i>
o =	-22.31	+ 3.254	+ 3.268	+ 1.885	+ 2.466	+ <i>i</i>
o =	-25.47	+ 3.722	+ 3.734	+ 1.864	+ 3.069	+ <i>i</i>
o =	-23.53	+ 3.950	+ 3.961	+ 1.906	+ 3.319	- <i>i</i>
o =	-25.45	+ 4.360	+ 4.370	+ 2.006	+ 3.746	- <i>i</i>
o =	-46.85	+ 6.330	+ 6.336	+ 2.626	+ 5.676	+ <i>i</i>

The simultaneous determination of the five errors would give results of no value. Solving therefore the equations, and leaving *dr*, *dR* in the results, Dr. Schur got:—

<i>dx</i>	=	+	0.76	-	0.686 <i>dr</i>	-	0.691 <i>dR</i>	weight	9.57
<i>dy</i>	=	+	7.21	-	0.797 <i>dr</i>	-	0.797 <i>dR</i>	„	15.07
<i>i</i>	=	+	3.75					„	13.88

Probable error of one measure ± 1".53

Herr Hartwig made his measures with power 255. They are:—

Mean Time Strasburg.	Distance of Cusps.	Errors.
h m s	"	"
o 34 8.3	485.53 - <i>i</i>	- 1.51
42 13.4	575.33 - <i>i</i>	+ 0.67
46 35.5	597.09 - <i>i</i>	+ 1.08
50 5.5	601.34 + <i>i</i>	+ 0.66
53 53.5	598.85 + <i>i</i>	+ 1.47
o 57 13.6	589.72 + <i>i</i>	- 0.33
I 6 13.6	513.35 + <i>i</i>	- 1.18
9 39.7	461.08 + <i>i</i>	- 0.79
15 14.7	325.85 + <i>i</i>	+ 0.37

With the above values of the adopted corrections, and using the same notation, Herr Hartwig deduced from these measures the equations:—

o =	-23.69	+ 4.062 <i>dr</i>	+ 4.073 <i>dR</i>	+ 3.132 <i>dx</i>	+ 2.394 <i>dy</i>	+ <i>i</i>
o =	-19.61	+ 3.373	+ 3.387	+ 2.366	+ 2.197	+ <i>i</i>
o =	-19.27	+ 3.243	+ 3.257	+ 2.153	+ 2.220	+ <i>i</i>
o =	-15.24	+ 3.197	+ 3.212	+ 2.025	+ 2.273	- <i>i</i>
o =	-15.15	+ 3.210	+ 3.225	+ 1.927	+ 2.375	- <i>i</i>

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$$\begin{aligned} 0 &= -17.93 + 3.277 \, dr + 3.292 \, dR + 1.871 \, dx + 2.508 \, dy - i \\ 0 &= -23.95 + 3.831 + 3.843 + 1.883 + 3.190 - i \\ 0 &= -27.59 + 4.327 + 4.337 + 1.995 + 3.713 - i \\ 0 &= -44.07 + 6.662 + 6.666 + 2.740 + 5.990 - i \end{aligned}$$

and by solving them by the method of least squares, he got—

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$$\begin{aligned} dx &= + 0.53 - 0.681 \, dr - 0.692 \, dR && \text{weight } 3.68 \\ dy &= + 7.58 - 0.801 \, dr - 0.797 \, dR && \text{,, } 6.12 \\ i &= + 2.39 - 0.004 \, dr \pm 0.000 \, dR && \text{,, } 4.43 \end{aligned}$$

Probable error of a single measure $\pm 0''.81$

Taking the *Nautical Almanac* R.A. of the Sun as correct, we have—

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$$\begin{aligned} \left. \begin{array}{l} \text{Correction to} \\ \text{Moon's R.A.} \end{array} \right\} & \left. \begin{array}{l} -9.74 - 0.686 \, dr - 0.691 \, dR \\ +7.21 - 0.797 \, dr - 0.797 \, dR \end{array} \right\} \begin{array}{l} \text{Pr.E. } \pm 0.49 \\ \text{,, } \pm 0.39 \end{array} \left. \begin{array}{l} \\ \end{array} \right\} \begin{array}{l} \text{by Dr. Schur; Auck-} \\ \text{land Heliumeter.} \end{array} \\ \left. \begin{array}{l} \text{Correction to} \\ \text{Moon's Decl.} \end{array} \right\} & \left. \begin{array}{l} -9.97 - 0.681 \, dr - 0.692 \, dR \\ +7.58 - 0.801 \, dr - 0.797 \, dR \end{array} \right\} \begin{array}{l} \text{,, } \pm 0.43 \\ \text{,, } \pm 0.33 \end{array} \left. \begin{array}{l} \\ \end{array} \right\} \begin{array}{l} \text{by Herr Hartwig;} \\ \text{Mauritius Heliumeter} \end{array} \end{aligned}$$

These corrections agree with the results of the Greenwich observations of this Eclipse given in the November Number of the *Monthly Notices*, pp. 38, 39, with due regard to the difference in the adopted value of the semidiameters of Sun and Moon.

The ending of the eclipse was observed:—

Mean Time					
Strasburg.					
h	m	s			
1	19	12	Dr. Schur	Power 47	
1	19	18	Herr Hartwig	,, 155	Sky very whitish.

Taking the mean of the above corrections of the Moon's place, and using the values for the diameters of the Sun and Moon employed in the former calculations, the ending of the Eclipse is found to take place at 1^h 19^m 38^s.5 Strasburg mean time. The difference between observation and calculation, great as it appears to be, is accounted for by the smallness of the telescopes, and the extreme slowness of the rate of separation of the limb of the Sun and Moon; the distance of the centres changing only one second of arc in about nine seconds of time.

Strasburg, 1875, Dec. 14.